In the Claims:

1. A data storage medium comprising: a substrate; and a plurality of elongate carrier molecules anchored to the substrate, each carrier molecule carrying one or more luminescent groups and being alterable between a readable conformation in which the luminescent groups carried by the molecule are able to emit radiation and an inactive conformation in which the luminescent groups carried by the molecule are inhibited from emitting radiation.

2. A data storage medium according to Claim 1, wherein each of the plurality of elongate carrier molecules is associated with one or more quencher groups located such that when each molecule is in the inactive conformation, the or each quencher group renders the luminescent group of the molecule inactive.

3. A data storage medium according to Claim 2, wherein the distance between the or each quencher group and each luminescent group carried by the associated elongate carrier molecule when in the readable conformation is at least 50 nm.

4. A data storage medium according to Claim 2, wherein the distance between the or each quencher group and each luminescent group carried by the associated elongate molecule when in the inactive conformation is less than 50 nm.

5. A data storage medium according to Claim 2 wherein, the or each quencher group is carried by its associated elongate carrier molecule.

6. A data storage medium according to Claim 5, wherein the quencher groups are provided substantially adjacent the substrate.

7. A data storage medium according to Claim 5 wherein the elongate carrier molecules are carrier oligonucleotides and the or each quencher group is attached to its respective carrier oligonucleotide via an attachment oligonucleotide having a sequence complementary to a sequence of the respective carrier oligonucleotide.

8. A data storage medium according to Claim 2, wherein the or each quencher group is carried by the substrate.

9. A data storage medium according to Claim 2, wherein fewer than ten quencher groups per luminescent group are associated with each elongate, carrier molecule.

10. A data storage medium according to Claim 9, wherein one or two quencher groups per luminescent group are associated with each elongate, carrier molecule,

11. A data storage medium according to Claim 9, wherein five to ten quencher groups per luminescent group are associated with each elongate, carrier molecule.

12. A data storage medium according to Claim 2, wherein at least one of said one or more quencher groups is able to quench incident light on adjacent luminescent groups when their associated elongate, carrier molecule is in the inactive conformation.

13. A data storage medium according to Claim 2, wherein at least one of said one or more quencher groups is able to quench light from being emitted from adjacent luminescent groups when their associated elongate, carrier molecule is in the inactive conformation.

14. A data storage medium according to the preceding Claim 1, wherein the substrate has luminescent group quenching properties such that when the elongate, carrier molecule is in the inactive conformation, the substrate renders inactive the luminescent group or groups carried by the molecule.

15. A data storage medium according to Claim 1, wherein the substrate is made from a metal.

16. A data storage medium according to Claim 15, wherein the metal comprises gold.

17. A data storage medium according to Claim 1, wherein the conformation of the elongate, carrier molecule in the inactive conformation inhibits the luminescent group or groups carried by the molecule.

18. A data storage medium according to Claim 1 wherein the substrate is a plasmon transmitting substrate.

19. A data storage medium according to Claim 18 wherein said one or more luminescent groups are located less than 5nm from the substrate when their respective elongate carrier molecule is in the inactive conformation.

20. A data storage medium according to Claim 18 wherein said one or more luminescent groups are located between 20 and 100nm from the substrate when their respective carrier molecule is in the readable conformation.

21. A data storage medium according to Claim 1, wherein the elongate, carrier molecules are carrier polymers.

22. A data storage medium according to Claim 21, wherein the carrier polymers are organic carrier polymers.

23. A data storage medium according to Claim 22, wherein the carrier polymers are carrier oligonucleotides.

24. A data storage medium according to Claim 23, wherein the carrier oligonucleotides are carrier DNA oligonucleotides.

25. A data storage medium according to Claims 23, wherein said one or more luminescent groups are attached to their respective carrier oligonucleotide via an attachment oligonucleotide having a sequence complementary to a sequence of the respective carrier oligonucleotide.

26. A data storage medium according to Claim 23, wherein each carrier oligonucleotide is anchored to the substrate by an intermediating linker oligonucleotide, the linker oligonucleotide being anchored to the substrate and comprising a nucleotide sequence complementary to a sequence of the carrier

oligonucleotide such that said sequences form a duplex, binding the carrier oligonucleotide to the linker oligonucleotide.

27. A data storage medium according to Claim 22, wherein the organic carrier polymers are carrier polypeptides.

28. A data storage medium according to Claim 27, wherein said polypeptide comprises an α-helix domain.

29. A data storage medium according to Claim 27, wherein said polypeptide comprises a β-sheet domain.

30. A data storage medium according to Claim 27, wherein said polypeptide comprises a flexible loop.

31. A data storage medium according to Claim 1, wherein each elongate, carrier molecule is movable between the readable and inactive conformations under the influence of an electric field.

32. A data storage medium according to Claim 31, wherein the electric field is positive.

33. A data storage medium according to Claim 31, wherein the electric field is negative.

34. A data storage medium according to Claim 31 wherein the electric field is alternating.

35. A data storage medium according to Claim 34, wherein the electric field alternates at a frequency of up to 10MHz.

36. A data storage medium according to Claim 34, wherein the electric field alternates at a frequency of from 10kHz to 1MHz.

37. A data storage medium according to Claim 1, wherein each elongate, carrier molecule is movable between the readable conformation and the inactive conformation under the influence of a magnetic field.

38. A data storage medium according to Claim 1, wherein the alteration of an elongate, carrier molecule between the inactive conformation and the readable conformation comprises a stretch, flip, fold or rotation thereof.

39. A data storage medium according to Claim 1, wherein each elongate, carrier molecule carries a plurality of distinguishable luminescent groups.

40. A data storage medium according to Claim 39, wherein each elongate, carrier molecule carries four distinguishable luminescent groups.

41. A data storage medium according to Claim 1, wherein each elongate, carrier molecule carries one or more groups carrying an electrical charge.

42. A data storage medium according to Claim 1, wherein said one or more luminescent groups each comprises one or more luminophores.

43. A data storage medium according to Claim 1, wherein said one or more luminescent groups each comprises one or more semiconductor nanocrystals.

44. A data storage medium according to Claim 1, wherein said radiation is visible radiation.

45. A data storage medium according to Claims 1 wherein said radiation has a wavelength of from 0.70 to 1.5 μm.

46. A data storage medium according to Claim 1 wherein said radiation has a wavelength of from 0.2 μm to 0.4 μm.

47. A writer for a data storage medium incorporating a plurality of elongate, carrier molecules each capable of carrying one or more luminescent groups and being alterable between a readable conformation and an inactive conformation, the writer comprising: a plurality of luminescent groups selectively attachable to each elongate, carrier molecule.

48. A writer according to Claim 47, wherein the elongate, carrier molecules are carrier oligonucleotides and each luminescent group comprises an attachment oligonucleotide having a sequence complementary to at least a portion of the sequence of one or more of the carrier oligonucleotides.

49. A writer according to Claim 47 further comprising a probe capable of effecting an alteration of one or more selected elongate, carrier molecules of the data storage medium from the inactive to the readable conformation, the luminescent groups being attachable to elongate, carrier molecules in the readable conformation but unattachable to elongate, carrier molecules in the inactive conformation.

50. A method of writing to a data storage medium incorporating a plurality of elongate, carrier molecules each capable of carrying one or more luminescent groups and being alterable between a readable conformation and an inactive conformation, comprising the steps of:

selectively attaching luminescent groups to each elongate, carrier molecule.

51. The method of Claim 50, wherein the step of selectively attaching luminescent groups comprises activating a selected elongate, carrier molecule to increase the attachability of luminescent groups to the elongate, carrier molecule and providing luminescent groups to the medium such that they attach to the activated elongate, carrier molecule.

52. The method of Claim 51, wherein the step of activating the selected elongate, carrier molecule comprises altering the molecule from its inactive to its readable conformation.

53. A writer for a data storage medium incorporating a plurality of elongate, carrier molecules each carrying one or more luminescent groups having a first

operative state and being alterable between a readable conformation and an inactive conformation, the writer comprising:

a switch for switching the operative state of selected luminescent groups to a second operative state.

54. A writer according to Claim 53 wherein in the first operative state the luminescent groups are operative and in the second operative state the luminescent groups are inoperative.

55. A writer according to Claim 53, further comprising means for a write-enablor which can write-enable selected luminescent groups, the switch for switchin the operative state of selected luminescent groups being effective only on write-enabled luminescent groups.

56. A writer according to Claim 55, wherein the write-enablor or writer for write-enabling selected luminescent groups comprises a probe capable of effecting alteration of one or more selected elongate, carrier molecules from the inactive to the readable conformation.

57. A writer according to Claim 55, wherein the switch for switching the operative state of selected luminescent groups to a second operative state comprises a redox state altering enzyme.

58. A writer according to Claim 55, wherein the switch for switching the operative state of selected luminescent groups to a second operative state comprises a photobleacher.

59. A writer according to Claim 53further comprising a switch for switching the operative state of selected luminescent groups to the first operative state.

60. A method of writing to a data storage medium incorporating a plurality of elongate carrier molecules, each carrying one or more luminescent groups having a first operative state and being alterable between a readable conformation and an inactive conformation, comprising the steps of:

selectively switching the operative state of selected luminescent groups to a second operative state.

61. A method according to Claims 60 wherein in the first operative state the luminescent groups are operative and in the second operative state the luminescent groups are inoperative.

62. A method according to Claim 60, further comprising the step of write-enabling one or more selected elongate, carrier molecules, prior to switching the operative state of the write-enabled molecules.

63. A method according to Claim 62, wherein the step of write-enabling one or more selected elongate, carrier molecules comprises altering the molecule from the inactive to the readable conformation.

64. A method according to Claims 60, wherein the step of switching the operative state of selected luminescent groups comprises altering the redox state, or quantum yield of the luminescent groups.

65. A method according to Claim 64, wherein altering the redox state of the luminescent groups comprises providing a redox-state altering enzyme.

66. A method according to Claim 64, wherein altering the quantum yield of the luminescent groups comprises providing a photobleacher.

67. A method according to Claim 60 further comprising the step of selectively switching the operative state of selected luminescent groups to the first operative state.

68. A reader for a data storage medium incorporating a plurality of elongate, carrier molecules, each carrying one or more luminescent groups and being alterable between a readable conformation and an inactive conformation, the reader comprising:

a probe capable of effecting an alteration of one or more selected elongate, carrier molecules of the data storage medium from the inactive to the readable conformation.

69. A reader according to Claim 68 further comprising:

a radiation source directable on the data storage medium; and

a detector for detecting radiation emitted by the luminescent groups.

70. A reader according to Claim 69, wherein the radiation source is a light source, of visible radiation.

71. A reader according to Claim 69, wherein the radiation source is a source of radiation having a wavelength of between 0.70 and 1.5μm.

72. A reader according to Claim 69, wherein the radiation source is a source of radiation having a wavelength of between 0.2 and 0.4 μm.

73. A reader according to Claim 69, wherein the plurality of elongate, carrier molecules are anchored to a substrate and the radiation source comprises an evanescent field generator.

74. A reader according to Claim 73, wherein the substrate is substantially planar, the plurality of elongate, carrier molecules being anchored to one side of the substrate, and the evanescent field generator is directable on the other side of the substrate.

75. A reader according to Claim 69, wherein the reader comprises a plurality of radiation sources and/or detectors.

76. A reader according to Claim 68, wherein the reader comprises a plurality of probes.

77. A reader according to Claim 68, wherein the or each probe is operable to carry an electrical charge.

78. A reader according to Claim 77, wherein the electric charge is positive direct current.

79. A reader according to Claim 77, wherein the electric charge is negative direct current.

80. A reader according to Claim 77, wherein the electric charge is alternating.

81. A reader according to Claim 80, wherein the electric charge alternates at a frequency of up to 10MHz.

82. A reader according to Claim 81, wherein the electric charge alternates at a frequency of from 10kHz to 1MHz.

83. A reader according to any one of Claims 68 to 82, wherein the or each probe is capable of effecting alteration of the one or more selected carrier polymers from the inactive to the readable conformation over an area of less than 100 nm^2.

84. A method of reading a data storage medium incorporating a plurality of elongate, carrier molecules, each carrying one or more luminescent groups and being alterable between a readable conformation and an inactive conformation, comprising the step of effecting an alteration of one or more selected elongate, carrier molecules of the data storage medium from the inactive to the readable conformation.

85. A method according to Claim 84 further comprising the steps of directing radiation on the one or more selected elongate, carrier molecules and detecting radiation emitted by the luminescent groups.

86. A method according to Claim 84 or 85 wherein the step of effecting an alteration of one or more selected elongate, carrier molecules comprises stretching, flipping, folding or rotating the molecule.

87. The writer of Claim 47, wherein the plurality of elongate carrier molecules are located on one or more sets of oppositely facing electrodes.

88. The writer of Claim 53, wherein the plurality of elongate carrier molecules are located on one or more sets of oppositely facing electrodes.

89. A data storage medium of Claim 1, in which the substrate is in the form of at least one set of oppositely facing electrodes..